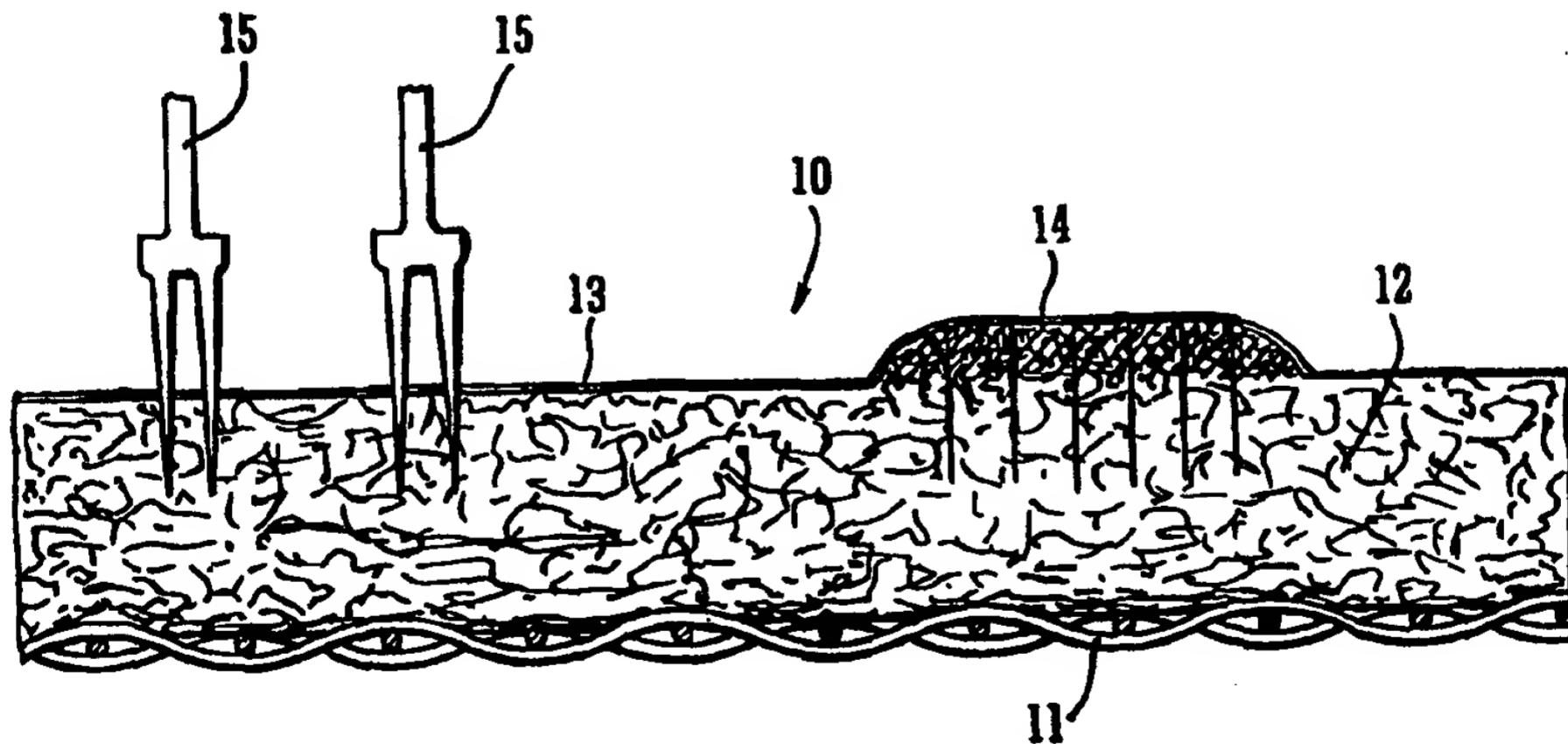




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(72) Inventor; and		Published	
(75) Inventor/Applicant (for US only): SAYERS, Ian, Christison [GB/GB]; 30 Chesterbrook, Ribchester, Lancashire PR3 3XT (GB).		With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	
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## (54) Title: PAPER MAKING FELTS



## (57) Abstract

A papermaking fabric (10) for producing paper with a pattern embossed thereon, the fabric (10) comprising a base layer (11), in the form of a woven substrate, and a fibrous batt layer (12) with a paper contacting surface (13). Raised patterns (14) are provided in the paper contacting surface (13) by needling selected areas of the surface (13) by forked needles (15).

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### PAPERMAKING FELTS

This invention relates to papermaking felts and in particular to press and marking felts for use in producing paper with a pattern embossed thereon.

5           Marking felts are used for example to produce paper including tissues, which requires a pattern to be embossed thereon. This may be achieved by means of an embossed pattern on the felt surface, or by harder yarns disposed as required just below a fibrous face layer of the felt. Embossed felts may also be used in the web pick-up arrangement of a  
10          Yankee machine which transfers the formed web to a press felt.

WO 96/25555 discloses a forming or dryer fabric for a papermaking machine which has patterned resin surface with openings through which air and/or water is conveyed during formulation or drying of the paper. Manufacture of such a fabric is time consuming and expensive.

15          In co-pending application No. 9626153.2 we disclose a method of making such a fabric wherein a batt of fibres is at least partially melted using ultrasonic energy and a pattern is imprinted into the batt whilst the fibres are in a molten state, by means for example of an engraving wheel or roller.

20          This last method is only usable with batts of thermoplastic and similar synthetic fibres which are susceptible to melting with the use of ultrasonic

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energy.

The present invention is concerned with an alternative method of providing a felt having relatively raised and relatively depressed areas which is useable with fibres of any material, thermoplastic, natural or otherwise.

5       In accordance with the present invention, a papermaking felt has a paper contacting surface provided by a fibrous batt layer, wherein the surface batt fibres are needled selectively to provide raised patterns.

The batt may comprise a blend of two or more fibres with significantly different melting points, eg polypropylene and polyamide 6.

10      The felt may be heat set after needling which causes the lower melting point fibres to melt and then resolidify at the end of heat setting to act as a rigidising polymer material which reinforces the patterns formed of higher melting point fibres and improves resistance to the elevated patterned regions to compaction.

15      The blended fibres may be provided in one or more layers within the fabric, at least one of which is at or close to the surface of the felt which is to be embossed.

20      Alternatively, at least one batt layer predominantly or wholly comprising relatively low melting point fibres may be used close to or at the surface to be embossed. In this case structured needling with forked needles may ensure that the raised pattern regions will have a high content

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of low melting point fibre whilst the main surface in the lower plane will be mainly higher melting point fibres, forming an embossed surface with rigid compaction resistant raised patterns.

Needling may be carried out by known needling machines, in  
5 accordance with a pattern applied e.g. electronically to controls of the needling machine, selected areas being needled in such a manner as to provide raised regions, the remainder of the surface being needled so as to leave relatively depressed regions.

An embodiment of the invention is now described by way of example  
10 with reference to the accompanying drawing, which is a diagrammatic cross section of a paper making felt in accordance with the invention.

A paper making felt 10, such as an embossing felt or a press felt, comprises a base layer 11, in the form of a woven substrate, which carries in the simplest form of the invention, a fibrous batt layer 12 which provides  
15 a paper contacting surface 13 on its side opposite the base layer 11.

Batt layer 12 comprises a mixture of relatively high melting point polyamide 6 fibres, and relatively low melting point polypropylene fibres.

To produce raised areas such as 14, selected areas of the surface 13 are needled, such as by forked needles 15. This produces a raised area of  
20 pulled fibres and fibrils which is then bonded by heat treatment of the surface 13 which melts the low melting point polypropylene fibres creating

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a matrix towards the surface 13 at least which embeds the higher melting point polyamide fibres, and also consolidates the raised areas, forming an embossed surface with rigid compaction resistant raised patterns.

Suitable machines for use in the needling step include Fehrer AG's  
5 NL21 and NL9/S needling machines.

The pattern applied to the surface 13 will depend upon the desired characteristics of the paper or tissue to be carried by the felt - e.g. to produce spot embossings on tissues to maintain tissue coherence without substantial reduction of porosity will necessitate relatively small well spaced  
10 raised spots on the felt.

The base layer 11 may be any form of fabric substrate or base layer used in the art, such as a perforated membrane, a non-woven layer, or a spiral link fabric.

The fabric may comprise more than a single batt layer, and may  
15 comprise other layers apart from the surface layer which is adapted for embossing and heat treatment, to impart other desired properties, such as resilience, porosity or mechanical strength.

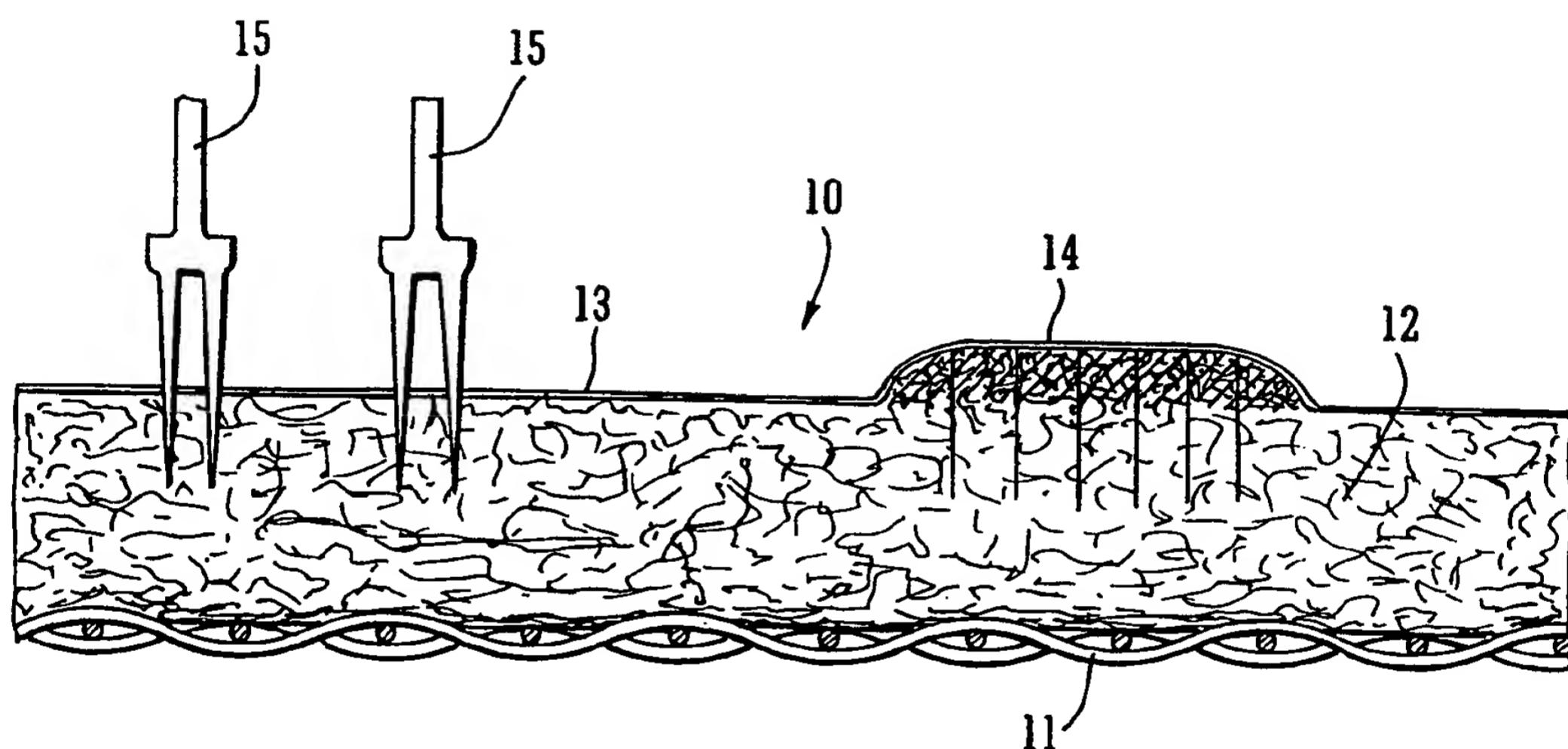
**CLAIMS**

1. A papermaking felt, said felt having a paper contacting surface provided by a fibrous batt layer, characterised in that the surface batt fibres are needled selectively to provide raised patterns.
- 5 2. A papermaking felt according to claim 1 wherein the fibrous batt layer comprises a blend of two or more fibre types with significantly different melting points.
3. A papermaking felt according to claim 2 wherein the blended fibres are provided in one or more layers within the fabric, at least one said layer 10 being at or close to said paper contacting surface which is to be embossed.
4. A papermaking felt according to claim 1 wherein at least one batt layer comprised predominantly or wholly by relatively low melting point fibres is located at or close to said paper contacting surface.
5. A papermaking felt according to claim 2 wherein said batt layer 15 comprises a mixture of relatively high melting point polyamide 6 fibres, and relatively low melting point polypropylene fibres.
6. A papermaking felt according to any preceding claim, wherein said paper contacting surface comprises one or more raised areas of pulled fibres and fibrils which is heat bonded to provide a matrix embedding higher 20 melting point fibres and forming an embossed surface with relatively compaction resistant raised areas.

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7. A process for making a papermaking felt, comprising selectively needling an exposed paper contacting surface of a fibrous batt layer to provide raised areas.
8. A process according to claim 7 wherein said batt comprises a blend of two or more fibre types with significantly different melting points.
- 5 9. A process according to claim 7 or 8 wherein the felt is heat set after needling, causing the lower melting point fibres to melt and resolidify to act as a rigidising polymer material which reinforces the raised areas.
10. A process according to claims 7, 8 or 9 wherein the needling is carried out with forked needles.
11. A process according to any one of claims 7, 8, 9 or 10 wherein the needling is carried out in accordance with a pattern controlling a needling machine, selected areas being needled to provide raised regions, the remainder of the surface being treated to leave relatively depressed regions.
- 15 12. A papermaking felt made by a process according to any of claims 7 to 11.

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A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 D21F7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 25555 A (PROCTER & GAMBLE) 22 August 1996 cited in the application see abstract; figures ----	1,7
A	US 5 372 876 A (JOHNSON MICHAEL C ET AL) 13 December 1994 see abstract; figures see column 3, line 9 - column 4, line 10 -----	1,7

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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## Information on patent family members

Int. Application No

PCT/GB 98/02415

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO 9625555	A 22-08-1996	US 5629052	A 13-05-1997	
		AU 4903196	A 04-09-1996	
		BR 9607584	A 07-07-1998	
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